

### 3.15 PALEONTOLOGICAL RESOURCES

This section evaluates the potential environmental impacts on paleontological resources that may result from construction of the Species Conservation Habitat (SCH) Project. Paleontology is a multidisciplinary science that combines elements of geology, biology, chemistry, and physics in an effort to understand the history of life on the earth. Fossils are paleontological resources that are the remains, imprints, or traces of once-living organisms preserved in rocks and sediments. They include mineralized, partly mineralized, or unmineralized bones and teeth, soft tissues, shells, wood, leaf impressions, footprints, burrows, and microscopic remains. Fossils are considered nonrenewable resources because the organisms they represent no longer exist. Thus, once destroyed, fossils can never be replaced.

The Project would be located at the southern end of the Salton Sea in the areas that were recently or are currently submerged, and in the drainages, floodplains, and deltas of the New and Alamo rivers. This region of the Imperial Valley is used mostly for agriculture. The study area for paleontological resources is the area where ground disturbances may expose and affect buried and unknown paleontological resources.

Table 3.15-1 summarizes the potential impacts of the six Project alternatives on paleontological resources compared to both the existing conditions and the No Action Alternative.

<b>Table 3.15-1 Summary of Impacts on Paleontological Resources</b>								
Impact	Basis of Comparison	Project Alternative						Mitigation Measures
		1	2	3	4	5	6	
Impact PALEO-1: Ground-disturbing activities could expose and damage undiscovered paleontological resources.	Existing Condition	S	S	S	S	S	S	MM PALEO-1: Prepare and implement a survey plan and a paleontological monitoring plan. MM PALEO-2: Conduct worker training. MM PALEO-3: Prepare and implement a paleontological resource data recovery plan.
	No Action	S	S	S	S	S	S	Same as Existing Condition
Note: O = No Impact L = Less-than-Significant Impact S = Significant Impact, but Mitigable to Less than Significant U = Significant Unavoidable Impact B = Beneficial Impact								

3.15.1 Regulatory Requirements

3.15.1.1 Federal Regulations

The Antiquities Act was the first law enacted to specifically establish that archaeological sites on public lands are important public resources, and it obligated Federal agencies that manage public lands to preserve the scientific, commemorative, and cultural values of such sites. This act does not refer to paleontological resources specially; however, the protection of “objects of antiquity” by various Federal agencies (understood to include paleontological resources) is included in the act.

*National Historic Preservation Act of 1966*

The National Historic Preservation Act of 1966 provides for the survey, recovery, and preservation of significant paleontological data when such data may be destroyed or lost due to a Federal, Federally licensed, or Federally funded project (Public Law 89 665; 80 Statute 915m 16 United States Code section 470 et seq.)

*Department of the Interior Report-Fossils on Federal and Indian Lands 2000*

In 2000, the Secretary of the Interior submitted a report to Congress entitled *Assessment of Fossil Management on Federal and Indian Lands* (United States Department of the Interior 2000). This report was prepared with the assistance of Federal agencies, including the United States (U.S.) Bureau of Indian Affairs, U.S. Bureau of Land Management, U.S. Bureau of Reclamation, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Park Service, and U.S. Geological Survey, as well as the Smithsonian Institution. The report concluded that administrative and congressional actions with respect to fossils should be governed by seven basic principles:

- Fossils on Federal land are a part of America’s heritage;
- Most vertebrate fossils are rare;
- Some invertebrate and plant fossils are rare;
- Penalties for fossil theft should be strengthened;
- Effective stewardship requires accurate information;
- Federal fossil collections should be preserved and available for research and public education; and
- Federal fossil management should emphasize opportunities for public involvement.

*Paleontological Resources Preservation Act of 2009*

The Paleontological Resources Preservation Act calls on the Secretary of the Interior to provide protection for vertebrate paleontological resources on Federal lands by limiting the collection of vertebrate fossils and scientifically important fossils to permitted and qualified researchers.

3.15.1.2 State Regulations

*Public Resources Code*

The California Public Resources Code has requirements for paleontological resource management (Chapter 1.7, section 5097.5, Archaeological, Paleontological, and Historic Sites). This statute specifies that state agencies may undertake surveys, excavations, and other operations as necessary on state lands

to preserve or record paleontological resources and defines any unauthorized disturbance or removal of a fossil site or remains on public land as a misdemeanor.

### 3.15.1.3 Other Guidance

#### *Imperial County*

The Imperial County General Plan (County of Imperial 1993) does not specifically address paleontological resources, but it emphasizes the conservation of historical and prehistoric resources.

#### *Paleontological Resource Assessment Guidelines*

The Society of Vertebrate Paleontology (SVP) has established standard guidelines (SVP 1995) that outline professional protocols and practices for conducting paleontological resource assessments and surveys, monitoring and mitigation, data and fossil recovery, sampling procedures, and specimen preparation, identification, analysis, and curation (SVP 1991, 1996). Most practicing professional vertebrate paleontologists adhere closely to the SVP's assessment, mitigation, and monitoring requirements included in the guidelines. Regulatory agencies often accept and utilize the professional standards set forth by the SVP.

### 3.15.2 Affected Environment

#### 3.15.2.1 Paleontological Resource Categories of Sensitivity

The SVP (1995) established three categories to be used for the purpose of assigning sensitivity, or the potential for a rock unit to yield significant paleontological resources: high, low, and undetermined. Each of these categories affects the degree to which paleontological mitigation is required.

**High Potential.** Rock units from which vertebrate or significant invertebrate fossils or suites of plant fossils have been recovered are considered to have a high potential for containing significant nonrenewable fossiliferous resources. These units include, but are not limited to, sedimentary formations and some volcanic formations that contain significant nonrenewable paleontologic resources anywhere within their geographical extent and sedimentary rock units temporally or lithologically suitable for the preservation of fossils. Sensitivity comprises both (a) the potential for yielding abundant or significant vertebrate fossils or for yielding a few significant fossils, large or small, vertebrate, invertebrate, or botanical, and (b) the importance of recovered evidence for new and significant taxonomic, phylogenetic, ecologic, or stratigraphic data. Areas that contain potentially datable organic remains older than Recent, including deposits associated with nests or middens, and areas that may contain new vertebrate deposits, traces, or trackways are also classified as significant.

**Low Potential.** Reports in the paleontological literature or field surveys by a qualified vertebrate paleontologist may allow determination that some areas or units have low potential for yielding significant fossils. Such units will be poorly represented by specimens in institutional collections.

**Undetermined Potential.** Specific areas underlain by sedimentary rock units for which little information is available are considered to have undetermined fossiliferous potential.

In general terms, for geologic units with high potential, full-time monitoring for paleontological resources is typically recommended during any Project-related ground disturbance. For geologic units with low potential, protection or salvage efforts typically are not required. For geologic units with undetermined potential, field surveys by a qualified paleontologist are usually recommended to specifically determine the paleontologic potential of the rock unit or units present within the assessment area.

The study area is underlain near the surface by late Pleistocene and Holocene alluvial deposits. At depth it is underlain by the fossil-bearing Lake Cahuilla beds and, to a lesser extent, by the underlying Brawley Formation, which both have a high sensitivity or potential to yield significant paleontological resources.

### **3.15.2.2 Paleontological Resource Inventory Results**

#### ***Site Geology and Paleontology***

##### **Quaternary Lake Deposits (Lake Cahuilla Beds)**

First named by Blake (1854, 1907), the Quaternary lake deposits (Lake Cahuilla beds) in the northern side of the Imperial Valley consist of interbedded, lens-shaped, and tabular beds of silt, sand, and clay that are probably less than 100 feet thick. Because of faulting and deformation of the basin, the Lake Cahuilla beds could be thinner or thicker. Beach and nearshore deposits mantle the margin of the Salton Sea, while deepwater sediments of Lake Cahuilla that accumulated in the vast axial areas of the Salton Trough support the productive agricultural center of the Imperial and Coachella valleys (Waters 1983; California Department of Water Resources [DWR] and California Department of Fish and Game [DFG] 2007). The study area is directly underlain by Lake Cahuilla beds. Although modern in age at the surface, these lake/playa sediments increase in age with depth, and at lower reaches may be late Pleistocene in age (40,000 years or less) (Maloney 1986). According to Van de Camp (2006), the Lake Cahuilla bed sediments come from two sources. The first source was the Colorado River, which at many times in the past flowed intermittently into the southern portion of the Salton Trough and deposited sand, silt, and mud in deltaic (delta), fluvial (stream), and lacustrine (lake) environments. The second source was the sediments derived from the basin, which consist of aeolian (wind-blown) sediments and alluvial and fluvial sediments, which are coarser sediments such as sands and, to a lesser extent, pebbles, gravel, and cobbles. Together, these sediment packages chronicle repeated inundations by the Colorado River and subsequent desiccations of the basin.

A recent study by Li (2003) and Li et al. (2007) dating various layers of calcareous tufa<sup>1</sup> at Travertine Rock near Salton City found evidence of at least 30 basin filling lakes in the Salton Trough in the last 20,000 years. Evidence of these inundations and subsequent desiccations are chronicled in the sediments of the Lake Cahuilla beds. Only the last five to ten lake phases of the Lake Cahuilla bed sediments (from 400 to 5,000 years before present) have been studied in any detail in other areas of the Salton Trough, such as Coachella Valley and the eastern and western areas adjacent to the Imperial Valley (Bowersox 1972; Waters 1980, 1983; Reynolds 1989; Whistler et al. 1995; Quinn 2000; Jefferson 2005; Wagner 2007; Crull et al. 2008; Lander 2009), but the paleontological content of the later Pleistocene and Holocene Lake Cahuilla deposits in the axial or central part of the Imperial Valley are largely unknown (Jefferson 2007, 2010a, 2010b).

The sediments of the Lake Cahuilla beds tend to be highly fossiliferous and often preserve late Pleistocene and Holocene invertebrates (diatoms, pollen, foraminifera, ostracods, freshwater clams, and snails); small vertebrates (fish, amphibians, reptiles, birds, and small to medium-sized mammals); and larger mammal fossils, some of which are large extinct mammals.

##### **Quaternary Brawley Formation**

First described by Dibblee (1954), the Quaternary Brawley Formation that underlies the Quaternary Lake (Lake Cahuilla beds) deposits at depth consists of interbedded, reddish-brown to gray, poorly sorted, clayey silts, and fine sands. According to Proctor (1968), the Brawley Formation is at least 2,000 feet thick. Recent work on the Brawley Formation indicates that these sediments are from the Pleistocene and

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<sup>1</sup> A carbonate coral-like rock that encrusts boulders along the shoreline of freshwater lakes.

range in age from about 1.1 to 1.2 million years (Dorsey 2006; Kirby et al. 2007) to about 40,000 years (Maloney 1986) before present.

Like the Lake Cahuilla beds, the Brawley Formation stratigraphic record represents a series of inundations of the Salton Trough by waters of the Colorado River. The river formed large freshwater to brackish lakes that persisted for some time and then disappeared with subsequent desiccations when the Colorado River was diverted back into its delta. The lithologic record of the Brawley Formation consists of alternating lacustrine (lake), fluvial (stream), and deltaic deposits, with subaerial (terrestrial) aeolian, playa (dry lake), and alluvial sediments. On the western side of the Salton Trough, paleontological evidence exists (echinoids [sand dollars, sea urchins] and foraminifers [microfossils]) of several possible marine incursions (Kirby et al. 2007).

The sediments of the Brawley Formation tend to be highly fossiliferous and often preserve late Pleistocene invertebrates (diatoms, pollen, foraminifera, ostracods, freshwater clams, and snails); small vertebrates (fish, amphibians, reptiles, birds, and small- to medium-sized mammals); and larger extinct mammal fossils.

### Records and Literature Search

A paleontological records and literature search was conducted at the Colorado Desert District Stout Research Center (CDDSRC) for the potential Project sites. Also reviewed were pertinent published literature and unpublished manuscripts, the previously prepared *Salton Sea Ecosystem Restoration Program Programmatic Environmental Impact Report* (PEIR) (DWR and DFG 2007), other related environmental documents, and other paleontological assessments. They included published articles on late Pleistocene vertebrate localities of California (Jefferson 1991a, 1991b). An online records search also was conducted at the Museum of Paleontology, University of California, Berkeley (2010).

The results of the CDDSRC search indicated that no previously known paleontological resource localities have been recorded within 1 mile of the proposed Project sites. It is important to note that none of the study area has been surveyed for surficial paleontological resources (Jefferson 2010b); however, the literature search revealed that during a paleontological resource field survey for the nearby proposed Salton Sea Unit 6 Generating Plant and Transmission Lines, three fossil mollusk sites were identified within Lake Cahuilla beds in the banks of irrigation ditches and New River drainage (Fisk 2002).

The online records search for microfossil, plant, invertebrate, and vertebrate localities conducted at the Museum of Paleontology, University of California, Berkeley indicated no previously recorded paleontological resources have been identified within 1 mile of the study area.

A search of the database of Late Pleistocene vertebrate localities of California (Jefferson 1991a, 1991b), which includes institutional records and published references, indicated no known paleontological resource localities are recorded within 1 mile of the study area.

## 3.15.3 Impacts and Mitigation Measures

### 3.15.3.1 Impact Analysis Methodology

The impact assessment methodology for paleontological resources follows guidelines provided by the SVP (1991, 1995). The assessment is based upon the potential for damage or disturbance as a result of ground-disturbing activities. Impacts would vary depending on the depth of construction required. Shallow excavation (e.g., 2 to 3 feet in depth) would have a low potential for causing impacts, while construction below 5 feet, such as required for the deeper pools within the ponds, interception ditch, brackish water pipeline, and sedimentation basin would have a greater potential for impacts. Much of the

Salton Sea basin, where the proposed Project sites are located, is underlain by sediments that are paleontologically sensitive (designated as having moderate to high paleontological sensitivity). Therefore, avoidance as a means to reduce or eliminate impacts on paleontological resources is not practical.

### 3.15.3.2 Thresholds of Significance

#### *Significance Criteria*

Impacts would be significant if the Project alternatives would cause:

- Physical damage to a scientifically useful fossil such that the data potential of that fossil is reduced or the specimen is destroyed; or unearthing of fossil(s) and removal from its stratigraphic context without appropriate scientific recordation of that context.

#### *Application of Significance Criteria*

The following summarizes the methodology used in applying the significance criteria to the Project alternatives:

**Physical damage to scientifically useful fossils or unearthing and removing fossils without appropriate scientific recordation** – The primary risks to fossils would result from damage during construction and possible looting of exposed fossils. A significant impact would occur if physical damage to a scientifically useful fossil occurred such that the data potential of that fossil were reduced, or the specimen were destroyed, and/or fossils were unearthed and removed from their stratigraphic context without appropriate scientific recordation of that context. This impact could result from construction-related excavations, unauthorized collection, or vandalism, or from erosion of paleontologically sensitive sediment unearthing and dispersing fossils (DWR and DFG 2007).

### 3.15.3.3 No Action Alternative

The description of the impacts of the No Action Alternative that is included in the PEIR is applicable to the SCH Project and summarized below (DWR and DFG 2007). This alternative would involve construction and operations and maintenance activities associated with pupfish channels and relocating recreational facilities as the Salton Sea recedes. Ground-disturbing activities that would occur under the No Action Alternative could result in physical damage to scientifically useful fossils, primarily near the eastern and western shorelines. Impacts also could result from the exposure and subsequent erosion of paleontologically sensitive sediment as the water recedes.

Under the No Action Alternative, paleontological surveys in areas with potential impacts directly attributable to the Imperial Irrigation District (IID) Water Conservation and Transfer Project would be conducted. In the event of a discovery during construction, all ground disturbances within 200 feet of the resource would be halted until the resource could be recovered by a qualified paleontologist.

The No Action Alternative would result in adverse impacts in comparison to existing conditions due to the disturbance of land in the sea bed and along the shoreline. The impacts would be partially mitigated as a result of the IID Water Conservation and Transfer Project mitigation measures between -235 and -248 feet mean sea level (msl). The area between the shoreline and -235 feet msl and below -248 feet msl that would be exposed under the No Action Alternative would not be subject to mitigation measures by IID.

### 3.15.3.4 Alternative 1 – New River, Gravity Diversion + Cascading Ponds

**Impact PALEO-1: Ground-disturbing activities could expose and damage undiscovered paleontological resources (significant impact).** Based on the records and literature searches, no known

paleontological resources have been exposed at the surface within the Project area (Jefferson 1991a, b, 2010b). In agricultural areas where the brackish water pipeline would be located, the underlying geology has been disturbed by repetitive plowing and other agricultural activities. Nonetheless, underlying geological formations present in the Project area are known to have a high sensitivity or potential to exist within the study area (DWR and DFG 2007; Jefferson 2010a, b). Potential is high that ground-disturbing activities, including pond excavations and brackish water pipeline construction, may expose and damage or remove from their stratigraphic context buried and unknown paleontological resources in the Lake Cahuilla beds and, to a lesser extent, in the Brawley Formation. They could include scientifically useful fossils, and impacts would be significant when compared to both the existing environmental setting and the No Action Alternative.

### *Mitigation Measures*

**MM PALEO-1: Prepare and implement a survey plan and a paleontological monitoring plan.** A plan for the survey of Project areas will be prepared to facilitate identification of paleontological resources prior to initiation of ground-disturbing activities. Additionally, prior to construction, a certified paleontologist retained by the lead agencies will supervise monitoring of construction excavations and produce a Paleontological Resource Management Recovery Plan. Paleontological monitoring will include inspection of exposed rock units and microscopic examination of matrix to determine if fossils are present. The monitor will have authority to temporarily divert grading away from exposed fossils to recover the fossil specimens. Monitoring will take place on a full-time basis when construction occurs at depths greater than 5 feet, part-time (4 hours a day) when excavations exceed 2 feet, and on a spot-check basis on excavations less than 2 feet. The paleontologist will document interim results of the construction monitoring program with monthly progress reports. Additionally, at each fossil locality, field data forms will record that locality, stratigraphic columns will be measured, and appropriate scientific samples will be submitted for analysis.

**MM PALEO-2: Conduct worker training.** Construction supervisors and crew will receive training by a certified paleontologist in the procedures for identifying and protecting paleontological resources, as well as procedures to be implemented in the event fossil remains are encountered during ground-disturbing activities.

**MM PALEO-3: Prepare and implement a paleontological resource data recovery plan.** If fossils are encountered during construction, construction activities will be temporarily diverted from the discovery, and the monitor will notify all concerned parties and collect matrix for testing and processing as directed by the Project paleontologist. To expedite removal of fossil-bearing matrix, the monitor will be empowered to request heavy machinery to assist in moving large quantities of matrix out of the path of construction to designated stockpile areas. Construction will resume at the discovery location once all the necessary matrix is stockpiled, as determined by the paleontological monitor. Testing of stockpiles will consist of screen washing small samples to determine if important fossils are present. If such fossils are present, the additional matrix from the stockpiles will be water screened to ensure recovery of a scientifically significant sample. Samples collected will be limited to a maximum of 6,000 pounds per locality.

The Project paleontologist will direct identification, laboratory processing, cataloguing, analysis, and documentation of the fossil collections. When appropriate, splits of rock or sediment samples will be submitted to commercial laboratories for microfossil, pollen, or radiometric dating analysis. Prior to construction, the lead agencies will enter into a formal agreement with a recognized museum repository and will curate the fossil collections, appropriate field and laboratory documentation, and the final Paleontological Resource Recovery Report in a timely manner following construction. A final technical report will be prepared to summarize construction monitoring and present the results of the fossil

recovery program. The report will be prepared in accordance with SVP guidelines and lead agency requirements. The final report will be submitted to the lead agency and the curation repository.

### *Residual Impacts*

Implementation of MM PALEO-1 through 3 would reduce impacts on paleontological resources to a less-than-significant level because appropriate measures would be taken to prevent physical damage to a scientifically useful fossil, recover data from uncovered fossils, and prevent looting through worker education.

#### 3.15.3.5 Alternative 2 – New River, Pumped Diversion

**Impact PALEO-1: Ground-disturbing activities could expose and damage undiscovered paleontological resources (significant impact).** The discussion under Alternative 1 is applicable to this alternative, although excavation would not be required for brackish water pipeline construction; therefore, the potential for impacts would be somewhat reduced. MMs PALEO-1 through 3 also are applicable to this alternative and would reduce this impact to less than significant.

#### 3.15.3.6 Alternative 3 – New River, Pumped Diversion + Cascading Ponds

**Impact PALEO-1: Ground-disturbing activities could expose and damage undiscovered paleontological resources (significant impact).** The discussion under Alternative 1 is applicable to this alternative, although excavation would not be required for brackish water pipeline construction; therefore, the potential for impacts would be somewhat reduced. MMs PALEO-1 through 3 also are applicable to this alternative and would reduce this impact to less than significant.

#### 3.15.3.7 Alternative 4 – Alamo River, Gravity Diversion + Cascading Pond

**Impact PALEO-1: Ground-disturbing activities could expose and damage undiscovered paleontological resources (significant impact).** The discussion under Alternative 1 is applicable to this alternative. MMs PALEO-1 through 3 also are applicable to this alternative and would reduce this impact to less than significant.

#### 3.15.3.8 Alternative 5 – Alamo River, Pumped Diversion

**Impact PALEO-1: Ground-disturbing activities could expose and damage undiscovered paleontological resources (significant impact).** The discussion under Alternative 1 is applicable to this alternative, although excavation would not be required for brackish water pipeline construction; therefore, the potential for impacts would be somewhat reduced. MMs PALEO-1 through 3 also are applicable to this alternative and would reduce this impact to less than significant.

#### 3.15.3.9 Alternative 6 – Alamo River, Pumped Diversion + Cascading Ponds

**Impact PALEO-1: Ground-disturbing activities could expose and damage undiscovered paleontological resources (significant impact).** The discussion under Alternative 1 is applicable to this alternative, although excavation would not be required for brackish water pipeline construction; therefore, the potential for impacts would be somewhat reduced. Mitigation MMs PALEO-1 through 3 also are applicable to this alternative and would reduce this impact to less than significant.

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**SECTION 3.0**  
**AFFECTED ENVIRONMENT, IMPACTS, AND MITIGATION MEASURES**

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**SECTION 3.0**  
**AFFECTED ENVIRONMENT, IMPACTS, AND MITIGATION MEASURES**

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